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HCMM ENERGY BUDGET DATA AS A MODEL INPUT FOR ASSESSING REGIONS OF HIGH POTENTIAL GROUNDWATER POLLUTION

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16. Abstract

Significant relationships have been found between surface soil temperatures estimated from HCMM radiometric temperatures and depth to groundwater and near surface soil moisture.

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A. Problems

None

B. Accomplishments

Analyses of day-night registered and apparent thermal inertia data have begun.

C. Significant Results

Previous progress reports (SDSU-RSI-79-01; SDSU-RSI-80-01) documented results relating to use of aircraft thermal data for evaluating depth to groundwater and soil moisture. These results are now being extended to HCMM data.

1. Groundwater

September 4, 1978, HCMM day thermal data were analyzed to assess depth to groundwater in the test site. HCMM apparent temperature were corrected for atmospheric effects using lake temperature of the Oahe Reservoir in central South Dakota. Surface soil temperatures were estimated using the equation

$$T_s = 0.79\ T_{HCMM} \times e^{(-0.80\ PC)} + 20.35 \qquad (1)$$

where T_s is surface soil temperature, T_{HCMM} 's radiometric temperature from HCMM, and PC is percent cover expressed as a fraction. This equation was developed from ground studies and was presented in earlier reports.

A significant relationship was found between T_s and depth to groundwater (Fig. 1). Depth to groundwater was correlated with soil water content (Fig. 2). Thus, the change in T_s shown in Fig. 1 was probably due to both the heat sink effects of the groundwater and thermal inertia effects

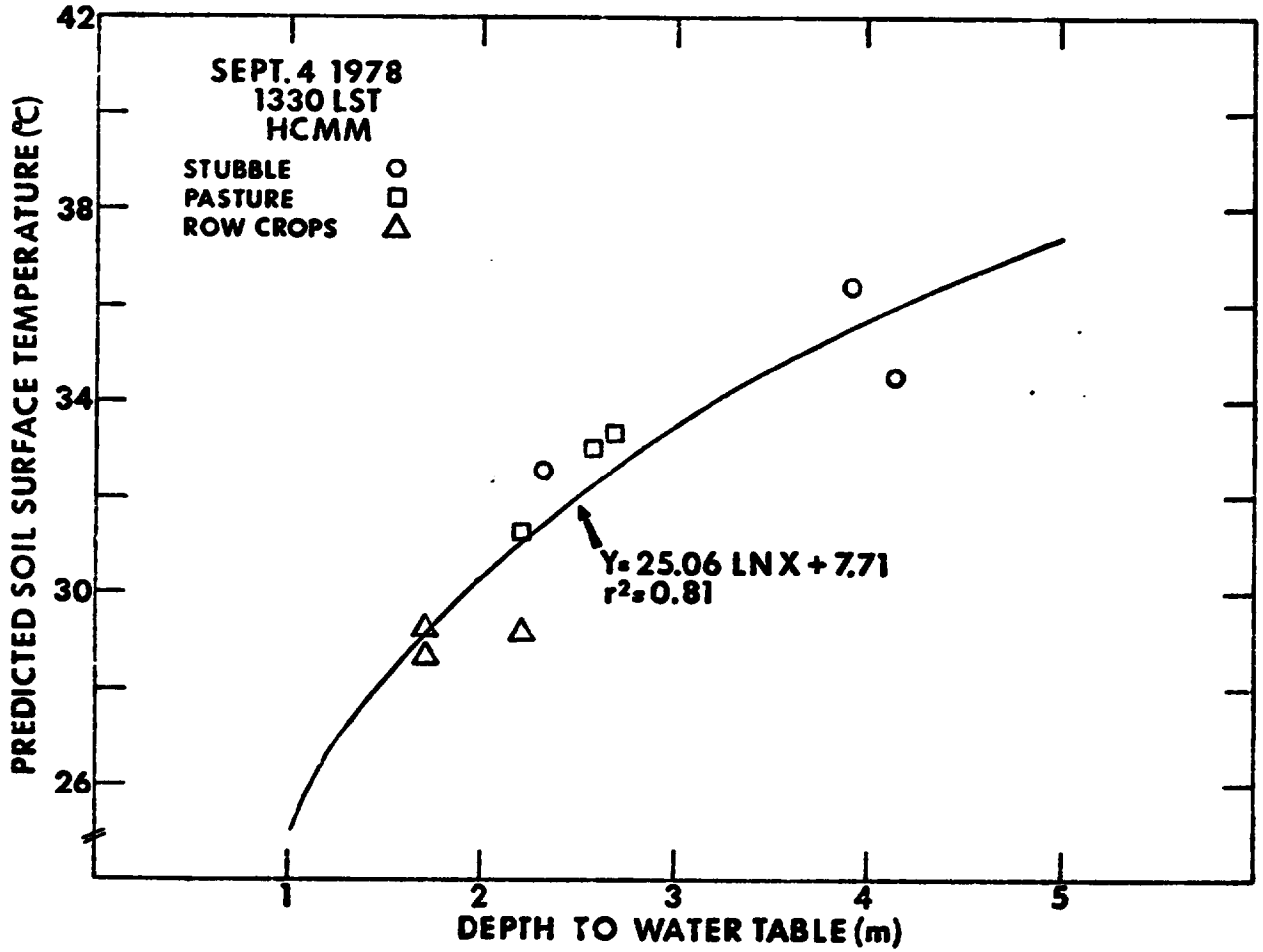

Fig. 1. Relationship of predicted soil surface temperatures to depth to groundwater.

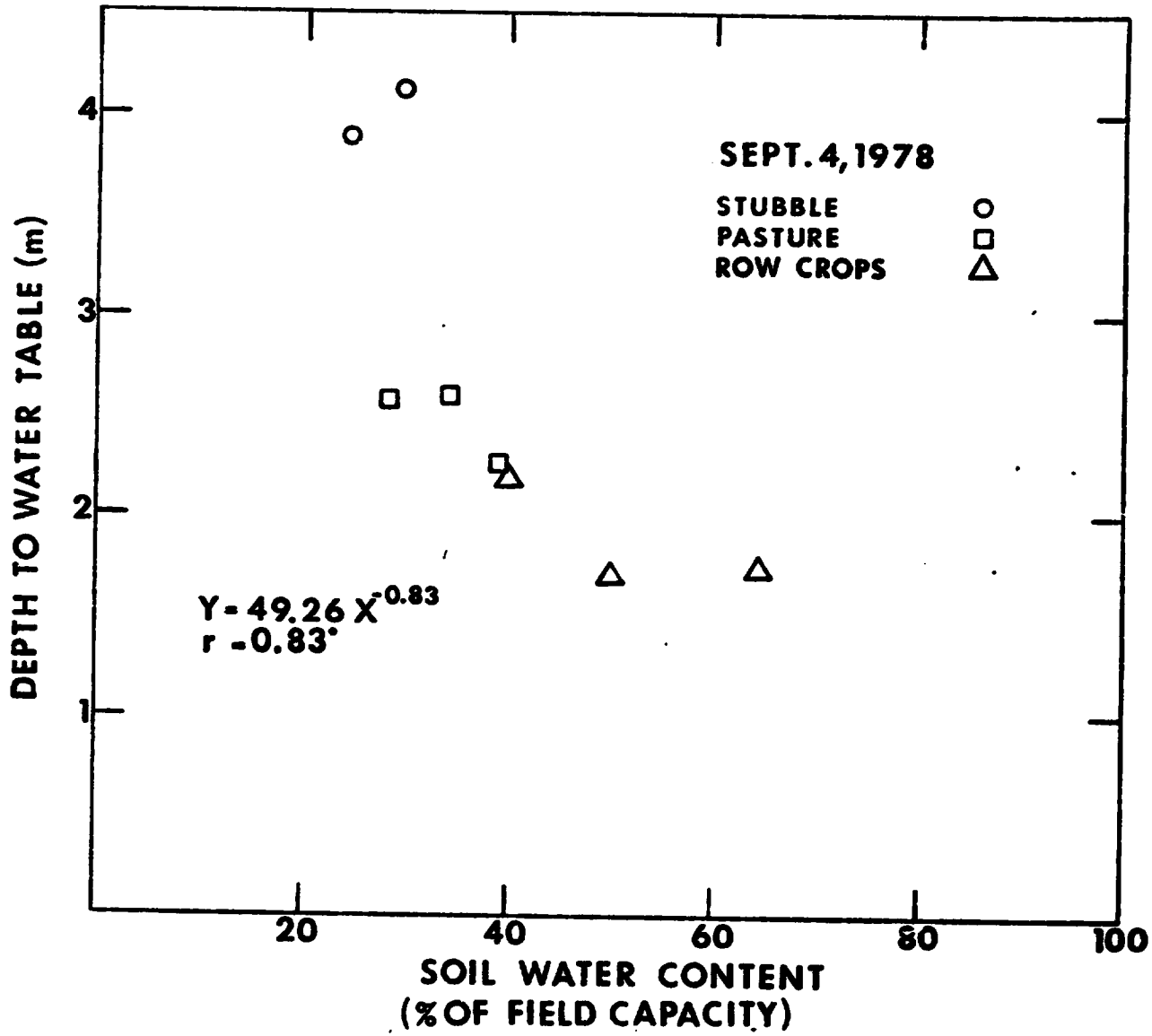

Fig. 2. Soil water content in the 0 to 50 cm layer as a function of depth to groundwater.

of soil moisture.

2. Soil Moisture

Three dates of HCMM data have been analyzed for soil moisture. A significant relationship was found between the surface soil-maximum air temperature differential and soil water content (% of field capacity) in the 0 and 4 cm layer of the profile (Fig. 3). T_s was predicted using HCMM radiometric temperature and equation (1). Land use for the data points in Fig. 3 consisted of row crops, small grains, stubble, and pasture. These results demonstrate a potential for empirically relating HCMM data to soil water content for a variety of land uses.

Groundwater and soil moisture analyses are continuing with other dates of HCMM data.

D. Publications

None

E. Recommendations

None

F. Funds Expended

$83,453.85

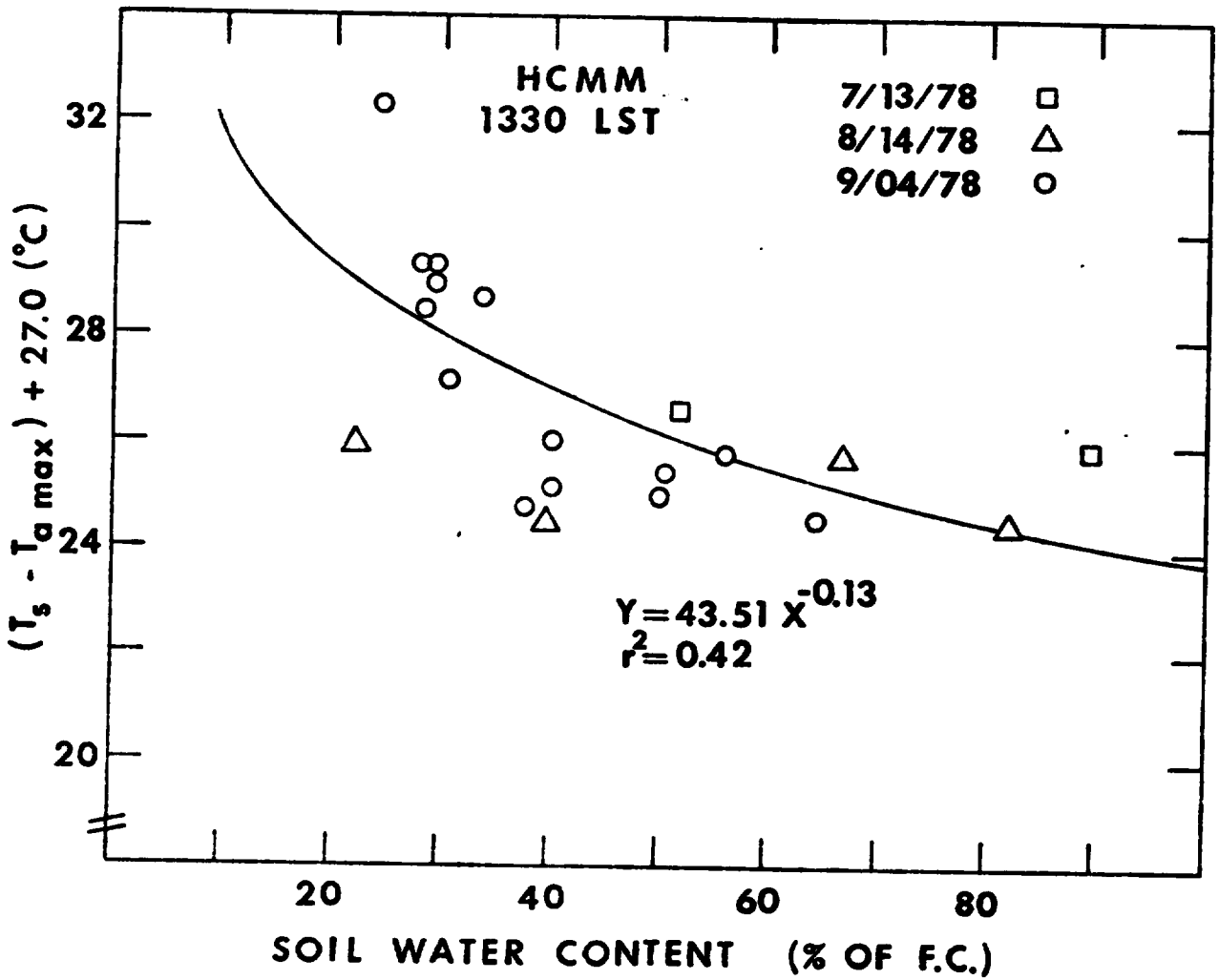

Fig. 3. Relationship of predicted soil surface temperature to soil water content in the 0 to 4 cm layer of the profile.